

Book Reviews / Critique

Alan V. Morgan, *New Views on an Old Planet: A History of Global Change*
by Tjeerd H. Van Andel / 207

J. R. Dietrich, *Interpretation of Three-Dimensional Seismic Data (Fourth Edition)*
by Alistair R. Brown / 207

J. R. Dietrich, *Applications of 3-D Seismic Data to Exploration and Production*
edited by P. Weimer and T. L. Davis / 208

William A. S. Sarjeant,
Roadside Geology of Hawaii
by Richard W. Hazlett and Donald W. Hyndman
Geology Underfoot in Illinois
by Raymond Wiggers / 209

William A. S. Sargeant, *Towards Stability in the Names of Animals. A History of
the International Commission on Zoological Nomenclature 1895 -1995*
by Richard V. Melville / 210

Book Reviews

New Views on an Old Planet: A History of Global Change.

By Tjeerd H. Van Andel
Cambridge University Press, New York
1994 (2nd edition), 439 p.
US\$59.95, hardcover
US\$24.95, paperback

Reviewed by Alan V. Morgan
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Two years ago at a GSA meeting I picked up this moderately thick text, attracted by a title that incorporated the term "global change". As a Quaternary geologist I was interested to see what the author would make of events in our world over the course of the last few million years. My initial reaction was delight to see how the topic had been covered, with simple line drawings and some very readable text. More recently I was asked to review the text and my first impression was renewed, albeit with a few caveats.

This second and more lengthy perusal confirmed that Andel's perspective on "global change" is far more encompassing than that of a Quaternary geologist. The book deals, literally, in Global Change (with a capital G and a capital C) from a time perspective that goes back to the origins of the planet, and this is reflected in the title. The discussions within the text encompass plate tectonics and evolution as well as topics closer to my heart such as sea-level changes, glaciation, orbital forcing and other phenomena.

The author states that the book origi-

nated as a course for non-geologists and this is reflected in a refreshingly easy-to-follow text. The book commences with two chapters that cover basic concepts involved in unravelling stratigraphic complexities and geologic time relationships. Following this is a three-chapter section on the recent climate of the "Ice Age". Chapter 5 provides an excellent overview of some of the modern ideas behind the causes of glacial stages. The succeeding section (3 chapters) covers continental drift, paleomagnetism and plate tectonics, including rifted margins and hot spots. Chapters 9 to 12 deal with changing oceans and climates, citing examples from the Phanerozoic and including a section on the carbon cycle. Chapters 13 to 15 deal with the first 4-billion years of Earth history, thus setting the stage for the appearance of higher life forms covered in the final four chapters of the book.

In many respects the text reflects a number of seemingly disjointed topics, and yet they hold together in a remarkably interesting fashion. The book does have its problems, however, including a number of irritating minor errors that should have been corrected in this second edition. These include confusing remarks such as "...the intrusion of a lava flow between two layers of sediment", and reference to "an intrusive lava dyke", to more serious matters. For example, the half-life of Carbon-14 is cited as 5,370 years instead of 5,730 years; the earliest life forms are ascribed to 3,200 my in one place and 3,800 my elsewhere, and the start of the Phanerozoic is given as 570 my rather than the presently accepted 540 my. There are disconcerting problems on some of the diagrams such as the scale in figure 3.1 which has 6 divisions representing 500 years, and figure 3.6 which shows northern Australia as "dry" in January! However, these, and other problems could and should be eliminated for the

next edition.

In summary, is the book worth it? In spite of my remarks immediately above the answer has to be yes. It is a book that could be easily read and understood by a literate lay person and should be ideally suited to a more esoteric undergraduate course dealing with global change. Unfortunately it is a little too specialised to be of use in a regular introductory class, since it is restricted to one aspect amongst the many topics which must be covered in basic Earth sciences. Nevertheless, if your interest lies in finding out more about our world, the text is almost light enough for bedtime reading. At the paperback price of US\$24.95, it is a bargain.

Interpretation of Three-Dimensional Seismic Data (Fourth Edition)

By Alistair R. Brown
*American Association of
Petroleum Geologists*
Memoir 42
1996, 456 p., US\$89.00

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Interpretation of Three-Dimensional Seismic Data (AAPG Memoir 42) was first published in 1986. Memoir 42 has been updated and expanded in subsequent editions published in 1988 and 1991, and, most recently, in this (1996) fourth edition.

The multiple editions of Memoir 42 mirror the substantial growth in the use of three-dimensional (3-D) seismic surveys for petroleum exploration and field development over the past decade. Reflecting this expansion, the current (fourth) edition of Memoir 42 contains more than double the volume of technical material presented in the first edition.

Interpretation of Three-Dimensional Seismic Data (Fourth Edition) is an impressive publication, splendidly illustrated with hundreds of color figures. Most of the figures are workstation-derived images of seismic sections and time slice maps from actual 3-D seismic data sets. The book is divided into nine chapters and two appendices, and includes a comprehensive index. The first chapter consists of a brief historical summary of 3-D seismic surveying, and a review of the basic concepts of 3-D data volume analysis, including technical terms, resolution considerations, and workstation developments. Chapter 2 presents a valuable discussion on the role of color in seismic interpretation, and related aspects of seismic-display polarity and wavelet phase. Chapters 3 and 4 outline the general interpretation procedures for structural and stratigraphic analyses of 3-D data volumes. Chapters 5 through 7 present more focussed discussions on 3-D imaging and mapping of individual reservoirs, including interpretation of hydrocarbon "bright spots," porosity and pay thickness analyses, and reservoir surveillance over time. Chapter 8 presents some of the newest material (not present in previous editions), including a review of the use of seismic reflection attributes (amplitude, frequency, attenuation) in data analysis, and the visualization of attribute data (the latter a contribution from G.A. Dorn). Chapter 9 presents a dozen case histories of 3-D seismic applications, representing a variety of geological and geographical settings (including such diverse areas as the Gulf Mexico, North Sea, and Alaska). The case history presentations are followed by two appendices, the first of which (a contribution from M. Lansley) provides a brief review of seismic data acquisition and processing considerations for 3-D data, and the second of which presents a novel interpretation exercise that will provide the non-specialist reader with a feel for 3-D data interpretation.

Interpretation of Three-Dimensional Seismic Data (Fourth Edition) will have obvious value to any geoscientist involved with 3-D seismic projects. For those not directly involved with or experienced in 3-

D seismic work, a perusal of the book would provide an excellent way to gain some appreciation of this technology. In combination with a recently published (1996) Atlas on 3-D seismic case histories (AAPG Studies in Geology, No. 42/ SEG Geophysical Development Series, No. 5), publicly available information on three-dimensional seismic analysis is now substantial. The geoscience community would undoubtedly benefit if 3-D seismic-based studies became part of the mainstream of published petroleum and sedimentary basin research.

Applications of 3-D Seismic Data to Exploration and Production

Edited by P. Weimer and T.L. Davis
*American Association of
 Petroleum Geologists
 Studies in Geology No. 42
 Society of Exploration Geophysicists
 Geophysical Development Series No. 5
 1996, 272 p., US\$127.00*

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Of the many technological advances in the petroleum exploration industry over the past 25 years none have had greater impact or significance than the development and use of three dimensional (3-D) seismic surveys. *Applications of 3-D Seismic Data to Exploration and Production* is an atlas-style publication that presents the most comprehensive collection of 3-D seismic case histories published to date. The atlas is jointly published by the AAPG and SEG and is designed to complement AAPG Memoir 42, *Interpretation of Three-Dimensional Seismic Data*. Memoir 42, published in 1986, included a few case histories but was generally focused on 3-D seismic interpretation methodology.

The 1996 *Applications* atlas is a lavishly illustrated publication designed (like most other geoscience atlases) to empha-

size large-scale figures and displays over text (about 75% of the atlas is represented by illustrative material, much of which is in color). Compared to other atlases with typically large (and often cumbersome) physical dimensions, the small size of the *Applications* atlas (11" x 17" ring-bound pages) provides for relatively easy use and storage.

The atlas begins with an overview chapter that reviews the historical (worldwide) development of 3-D seismic uses in exploration, field development and production. This is followed by 28 (case history) chapters which are conveniently organized into geological themes of reservoir types (fluvial-deltaic, eolian, and deep-water clastics, and carbonates) and structure. A final case history (Chapter 29) describes the use of 3-D seismic in a study of near-surface ground water contamination. The case histories include both exploration and field development situations, covering a broad range of geographic and geologic settings. As one might expect, the best represented geographic area is the United States Gulf coast and Gulf of Mexico (10 case history presentations). Perhaps reflecting the timing of atlas preparation, there is no specific case history on the Gulf of Mexico sub-salt play that has dominated exploration headlines over the past couple of years. The international arena is represented by case histories from such diverse areas as the North Sea, Australia, China, Colombia and the Middle East. Canada is represented by three case histories (on Devonian carbonate plays) from Alberta. The case histories, while individually diverse in technical detail, all emphasize the role of 3-D seismic data in imaging subtle (by conventional 2-D seismic standards) subsurface features and improving reservoir characterization. Of the many case histories that describe the benefits of 3-D over 2-D data interpretations, one of the best comparative analyses is documented in a structure case history from the North Sea in which 3-D data allows for identification of a pervasive fault system not apparent on 2-D data.

Applications of 3-D Seismic Data to Exploration and Production is an excellent publication of obvious value to any geoscientist working on 3-D seismic projects. For explorationists or researchers not directly engaged in 3-D data work, a perusal of the atlas would provide an excellent way to gain some appreciation of the ever-expanding field of three-dimensional seismic analysis.

Roadside Geology of Hawaii

By Richard W. Hazlett and
Donald W. Hyndman
Mountain Press Publishing Co.
Missoula Montana
1996, 304 p., US\$20.00

Geology Underfoot in Illinois

By Raymond Wiggers
Mountain Press Publishing Co.
Missoula, Montana
1997, 303 p., US\$15.00

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Each year many Canadians, seeking a greater variety in our geological scenery, travel southward or westward into the United States. For such geological travelers, the Mountain Press is rendering a great service by providing admirable and inexpensive guides to the various states.

The rocks of Hawaii are, of course, much more evident to casual view than those of Illinois. The account of Hawaiian geology is, as the book's name indicates, presented in relation to the roads upon which one might travel those islands. However, it is not a mere listing of outcrop and lithology, but surveys the history of the volcanoes (often by means of diagrams colored, appropriately enough, in shades of red). In addition, there are descriptions of the ancient reefs occurring in coastal regions of elevation; it is somehow unexpected, to this reader at least, that fossils are to be found in Hawaii! Many black and white photographs illustrate the geological features; color photographs would have been better, of course, but would have made the book prohibitively expensive.

As their title indicates, the authors are careful to adopt the proper Polynesian spelling of place-names, a courtesy to its indigenous peoples as rare in geological literature as it is refreshing, and certainly

an aid to pronunciation of words which, to non-Hawaiian eyes and ears, are often strange and difficult.

The second book generally corresponds in format with the first, but is less expensive since it does not feature any colored figures. Illinois geology is less evidently exciting than that of Hawaii but reflects a more complex history, spanning the whole of geological time back to the late Precambrian. This account is not confined to roadside outcrops, but treats the state region by region, including brief accounts of its mining history, and even a survey of the geology represented in Chicago's buildings! The author's cheerful writing style enlivens the text and makes one wish to visit his state.

Both these works are strongly recommended to any persons desiring to learn about the rocks south and west of Canada's borders. The numerous other works in these two Mountain Press series of guides are equally worth seeking. Go to it!

Towards Stability in the Names of Animals. A History of the International Commission on Zoological Nomenclature 1895-1995

By Richard V. Melville
International Trust for
Zoological Nomenclature
c/o Natural History Museum
Cromwell Road
London SW7 5BD, England
1995, 104 pages, £30

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Although the author of this volume is stated to be Richard V. Melville, the manuscript was incomplete at the time of his

death and finished by another hand. It is likely that, had Melville completed it, the history would have ended with a review and an assessment; but that was never to be written. Instead, Melville's own achievements are assessed, and his portrait included, as a supplement to his text.

Whereas the *International Code of Botanical Nomenclature* is currently a fat volume of 328 pages and has gone through many revisions — I have six on my shelves — the *International Code of Zoological Nomenclature* is much slimmer and has only been revised four times. Yes, the taxonomic problems of botanists are greater, with such matters as hybridization and the piecemeal preservation of different plant parts to contend with; but also the attitude to change of the taxonomists administering the zoological *Code* has been more rigid and their intransigence, in dealing with the particular problems of paleontologists, has been much greater. That is the reason why trace-fossils were admitted to the *Code* so late and so sloppily, and why the nomenclatural problems faced by micropaleontologists, in coping with such discrete elements as sclerites and spicules, remain so formidable.

It is a surprise, therefore, to learn how great have been the contributions of paleontologists to the framing of the *Code*, including Dr. Melville himself, who was a specialist on Mesozoic echinoids. Indeed, this history brings many surprises, showing how personality and historic chances have so often caused delays or modifications (some advantageous, some not) in the *Code's* formulation and application.

Though stiff in style and often rather too unspecific on details, this work remains salutary reading. The presentation and portraits are good, but the cost is high for so slim a volume. To paleontologists at least, I would recommend the reading of a library copy rather than purchase. The salvaging of Dr. Melville's text was a stout effort, but I'm left wondering how much better this book would have been, had he lived to finish it.

I am also left wondering, as all systematists and taxonomists must, whether the imminent and overdue fusion of the botanical and zoological *Codes* will bring heaven or headaches. The latter, I fear, seem likelier.